Mayors Reduce Spending in Response to Increased Monitoring to Minimize Electoral Backlash: Evidence from Anti-Corruption Audits in Brazil

Appendix

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A. List of spending categories

Table A1 shows the list of spending categories based on the data in http://www.ipeadata.gov.br/, both in the original Portuguese and their English translation. These are used to calculate the main outcome variables and appear in Figure 6 in the main text. See http://www.portaltransparencia.gov.br/pagina-interna/603315-orcamento-da-despesa for a brief description of each category. The definition of most categories is straightforward, but some are not. Special charges (*Encargos especiais*) are expenses not directly related to the provision of goods and services. These include debt repayment, reimbursement, restitution, and contributions to international organizations. They are the largest expense category across municipalities, according to CGU.

The Judicial, Legislative, and Municipal categories are expenses related to the basic operation of the corresponding government branch. These are usually fixed expenses and vary little over time.

In the current data, all municipalities report zero spending in the Regional development (*Desenvolvimento regional*) category. Therefore, this is implicitly excluded in the calculation of total spending per capita, and explicitly excluded in the analysis in Figure 6.

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	Original	Translation
1	Administração e planejamento	Administration and planning
2	Agricultura	Agriculture
3	Assistência e previdência	Social security
4	Ciência e tecnologia	Science and technology
5	Comunicações	Communications
6	Segurança nacional e defesa pública	Defense and security
7	Desportes e lazer	Sports and leisure
8	Desenvolvimento regional	Regional development
9	Educação e cultura	Education and culture
10	Encargos especiais	Special charges
11	Energia e recursos minerais	Energy and mineral resources
12	Habitação e urbanismo	Housing and urban planning
13	Indústria, comércio e serviços	Industry, commerce, and service
14	Essencial a justiça e direito da cidadania	Justice and citizen rights
15	Judiciária	Judicial
16	Legislativa	Legislative
17	Municipal	Municipal
18	Relações exteriores	Foreign relations
19	Saúde e saneamento	Health and sanitation
20	Trabalho	Employment
21	Transporte	Transportation

Table A1: List of spending categories

Note: Regional development excluded from analysis since all municipalities record zero spending in this category

B. Result tables

This section reports the numerical results underlying Figures 3-6 in the main text. All tables report estimates from OLS regression with term fixed effects and clustered standard errors by term.

- Table B1 corresponds to Figure 3
- Table B2 corresponds to Figure 4
- Table B3 corresponds to Figure 5
- Table B4 corresponds to Figure 6

	Total spending
Audited	−0.02*
	(0.01)
Term-limited	0.05*
	(0.01)
Interaction	0.01
	(0.02)
R^2	0.70
Adj. R^2	0.70
Num. obs.	20649
RMSE	0.37
N Clusters	5551

*$p < 0.05$

Table B1: Effect of audits on total spending per capita (logged) by term-limit status

	Total spending
Year 1	−0.00
	(0.02)
Year 2	0.02
	(0.02)
Year 3	−0.02
	(0.02)
Year 4	−0.07*
	(0.02)
Term-limited	0.04*
	(0.01)
Year 1 × Term-limited	−0.00
	(0.02)
Year 2 × Term-limited	−0.04
	(0.03)
Year 3 × Term-limited	0.05
	(0.03)
Year 4 × Term-limited	0.03
	(0.02)
R^2	0.70
Adj. R^2	0.70
Num. obs.	20649
RMSE	0.37
N Clusters	5551

*$p < 0.05$

Table B2: Effect of audit timing on total spending per capita (logged) by term limit status

	Total			
	Year 1	Year 2	Year 3	Year 4
Year 1	−0.04	−0.04	−0.03	−0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Term-limited	−0.01	0.02	0.03	0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Year 1 × Term-limited	−0.00	0.00	−0.01	0.01
	(0.05)	(0.05)	(0.05)	(0.05)
Year 2		−0.02	−0.01	−0.02
		(0.01)	(0.01)	(0.01)
Year 2 × Term-limited		−0.01	−0.01	−0.01
		(0.01)	(0.02)	(0.02)
Year 3			−0.08	−0.09*
			(0.03)	(0.02)
Year 3 × Term-limited			0.05	0.06
			(0.03)	(0.05)
Year 4				−0.10*
				(0.02)
Year 4 × Term-limited				0.05
				(0.03)
R^2	0.62	0.59	0.60	0.61
Adj. R^2	0.62	0.59	0.60	0.61
Num. obs.	18798	19497	20402	20637
RMSE	0.42	0.42	0.41	0.42
N Clusters	4	4	4	4

*$p < 0.05$

Table B3: Effect of audit timing on total spending per capita (logged) across the mayoral term in municipalities with reelection-eligible mayors

	Outcome	Estimate	Std. Error	FDR p-value
1	Agriculture	-0.088	0.037	0.128
2	Sports and leisure	-0.079	0.034	0.128
3	Defense and security	-0.062	0.028	0.128
4	Housing and urban planning	-0.040	0.032	0.530
5	Municipal	-0.038	0.014	0.128
6	Health and sanitation	-0.036	0.019	0.254
7	Transportation	-0.035	0.049	0.631
8	Administration and planning	-0.028	0.021	0.522
9	Justice and citizen rights	-0.022	0.024	0.631
10	Education and culture	-0.019	0.017	0.559
11	Communications	-0.016	0.017	0.631
12	Social security	-0.006	0.022	0.828
13	Foreign relations	0.003	0.004	0.631
14	Science and technology	0.005	0.009	0.667
15	Energy and mineral resources	0.008	0.037	0.835
16	Judicial	0.016	0.026	0.667
17	Legislative	0.020	0.037	0.667
18	Employment	0.021	0.026	0.631
19	Special charges	0.036	0.047	0.631
20	Industry, commerce, and service	0.050	0.038	0.522

Table B4: Effect of auditing on spending per capita (using $\ln(y+1)$ transformation) across budget categories in municipalities with reelection-eligible mayors

C. Using corruption as explanatory variable

This section reports the effect of the level of corruption uncovered by audits on spending outcomes. Corruption is measured as the number of moderate and severe infractions per service order (Avis, Ferraz, and Finan 2018). The CGU labels infractions with this criteria starting in 2006. I predict the values of the corruption variable before 2006 using a random forest (see Diaz 2021 for details).[1] One can only observe corruption in audited municipalities, so all models are restricted to that subset of the data. All models include state-term fixed effects and clustered standard errors by municipality.

- Table C1 shows results analogous to Table B1 here and Figure 3 in the main text
- Table C2 shows results analogous to Table B2 here and Figure 4 in the main text
- Table C3 shows results analogous to Table B3 here and Figure 5 in the main text
- Table C4 shows results analogous to Table B4 here and Figure 6 in the main text

In general, the results suggest that more uncovered corruption decreases total spending, especially close to an election year. However, the results are now similar between reelection-eligible and term-limited mayors. This suggests that, when higher levels of corruption are uncovered, term-limited mayors may also be concerned about protecting their reputation and future career prospects. Table C4 reinforces this idea by suggesting that the decrease in public spending comes primarily from highly visibly budget areas (transportation, agriculture, sports and leisure, health and sanitation).[2]

[1] **TO DO:** See if this results persist without the data coded by supervised learning.
[2] **TO DO:** Show a similar table for term-limited mayors. Ideally, the pattern is the same.

	Total spending
Infractions	-0.04^*
	(0.01)
Term-limited	0.17^*
	(0.06)
Interaction	-0.03
	(0.02)
R^2	0.64
Adj. R^2	0.64
Num. obs.	1994
RMSE	0.37
N Clusters	1770

$^*p < 0.05$

Table C1: Effect of corruption on total spending per capita (logged) by term limit status

	Total spending	
	Reelection-eligible	Term-limited
Year 1	-0.06^*	-0.07^*
	(0.02)	(0.03)
Year 2	0.02	0.01
	(0.03)	(0.03)
Year 3	0.04	-0.07
	(0.03)	(0.04)
Year 4	0.06	0.02
	(0.03)	(0.04)
R^2	0.69	0.55
Adj. R^2	0.68	0.53
Num. obs.	1347	647
RMSE	0.37	0.36
N Clusters	1240	630

$^*p < 0.05$

Table C2: Effect of corruption on total spending per capita (logged) by audit timing and term limit status (audit timing indicators omitted)

	Reelection-eligible				Term-limited			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Year 1	−0.01	−0.03	−0.03	−0.06*	−0.08*	−0.06	−0.06	−0.07*
	(0.03)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.03)	(0.03)
Year 2		0.01	0.02	0.02		0.00	0.00	0.01
		(0.03)	(0.03)	(0.03)		(0.04)	(0.04)	(0.03)
Year 3			0.02	0.04			−0.02	−0.06
			(0.03)	(0.03)			(0.04)	(0.04)
Year 4				0.05				0.03
				(0.03)				(0.04)
R^2	0.53	0.52	0.65	0.68	0.46	0.41	0.56	0.58
Adj. R^2	0.49	0.50	0.64	0.68	0.34	0.34	0.53	0.55
Num. obs.	342	638	1042	1339	156	279	458	643
RMSE	0.37	0.38	0.38	0.37	0.36	0.36	0.35	0.34
N Clusters	337	616	981	1238	153	275	447	628

$^{*}p < 0.05$

Table C3: Effect of corruption on total spending per capita (logged) across the term by audit timing in municipalities with reelection-eligible mayors (audit timing indicators omitted)

	Outcome	Estimate	Std. Error	FDR p-value
1	Transportation	-0.183	0.061	0.018
2	Agriculture	-0.181	0.042	0.000
3	Sports and leisure	-0.144	0.038	0.002
4	Legislative	-0.080	0.042	0.173
5	Housing and urban planning	-0.062	0.038	0.251
6	Health and sanitation	-0.056	0.019	0.021
7	Social security	-0.046	0.022	0.142
8	Municipal	-0.038	0.016	0.065
9	Energy and mineral resources	-0.029	0.042	0.696
10	Administration and planning	-0.025	0.025	0.592
11	Communications	-0.012	0.016	0.696
12	Employment	-0.012	0.030	0.819
13	Education and culture	-0.003	0.014	0.939
14	Justice and citizen rights	-0.003	0.028	0.957
15	Special charges	0.003	0.057	0.957
16	Foreign relations	0.007	0.005	0.320
17	Science and technology	0.008	0.014	0.721
18	Industry, commerce, and service	0.023	0.045	0.756
19	Defense and security	0.027	0.032	0.674
20	Judicial	0.032	0.029	0.545

Table C4: Effect of corruption on spending per capita (using $\ln(y+1)$ transformation) across budget categories in municipalities with reelection-eligible mayors

References

Avis, Eric, Claudio Ferraz, and Frederico Finan. 2018. "Do Government Audits Reduce Corruption? Estimating the Impacts of Exposing Corrupt Politicians." *Journal of Political Economy* 126 (5): 1912–64.

Diaz, Gustavo. 2021. "Bad Neighbors Make Good Fences: How Politicians Mitigate the Electoral Consequences of Nearby Corruption in Brazil." *Working Paper*. http://gustavodiaz.org/files/research/nearby_corruption.pdf.